DOCUMENT RESUME

ED 088 498 IR 000 332

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TITLE The Development of a Competency-Based Model for Use in Instructional Technology.
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PUB DATE Mar 74
NOTE 15p.; Paper presented at the Association for Educational Communications and Technology Annual Convention (Atlantic City, N.J., March 17 through 21, 1974)

EDRS PRICE MF-$0.75 HC-$1.50
DESCRIPTORS Behavioral Objectives; Curriculum Design; *Curriculum Development; Higher Education; Instructional Design; *Instructional Media; *Instructional Technology; Material Development; *Performance Based Teacher Education; *Performance Specifications; Program Descriptions; Program Development; Role Perception
IDENTIFIERS Model of Mastery

ABSTRACT

The faculty of the Division of Instructional Systems and Learning Resources at the University of Utah is developing a model for a competency-based curriculum in instructional media and technology. The group first defined the roles of the instructional technologist at different educational levels and then delineated appropriate functional expectations. These were divided into competencies which, in turn, were further broken down into behavioral objectives. The major program areas were identified as: instructional design; evaluation and selection; integration; utilization and dissemination; media design and production; administration and implementation; data processing; reference; instruction; and research and development. Standardized terms were specified and the Model of Mastery was adopted to assist in the development, implementation, and evaluation of instructional materials and programs. This Model allows instructors to evaluate alternative approaches by specifying stimuli, student responses, products of responses, effectiveness, cost and difficulty. Instructional modules based on this approach have been field-tested and the initial results are highly favorable. As a result, additional modules in the area of design and production of media, integration, utilization and dissemination are being prepared. (PB)

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THE DEVELOPMENT OF A COMPETENCY-BASED MODEL FOR USE IN INSTRUCTIONAL TECHNOLOGY

Current attempts to accommodate the needs of the individual have led to a number of innovations in education, including the development of competency-based programs. One such program in the area of instructional media is the one presently under development at the University of Utah in Salt Lake City.

Since the spring of 1971, the faculty of the Division of Instructional Systems and Learning Resources has been meeting for one afternoon a week for the purpose of developing a model around which the competency-based program can be structured.

Our efforts have resulted in the evolution of a model which has proved to be adaptable and versatile in the tests to which it has been subjected. The development of this model and its applications are the subjects to which this paper addresses itself.

Historically, several sources of input were utilized. The State Board of Education, in an effort not paralleling our own but related to it, had been working on some competency statements on which they planned to base the eligibility for the Instructional Media Endorsement to the Teaching Certificate. This material was considered as we proceeded with our program. At one point, we were called upon by the State to assist them in updating their competency statements.

We reviewed the literature and curriculum development work being undertaken elsewhere, including, among others, that of the Research Division of the Oregon System of Higher Education and that of the Syracuse

IR 000 332

University in the Development Institute. The Syracuse group identified several functions and arranged them under nine headings as follows:

Function 1: Organization Management

Function 2: Personnel Management

Function 3: Research - Theory

Function 4: Design

Function 5: Production

Function 6: Evaluation - Selection

Function 7: Utilization

Function 8: Utilization - Dissemination

Function 9: Supply

Lloyd E. McCleary's model for a competency-based curriculum was also employed. This model, shown three-dimensionally, is similar in appearance to the Guilford Model on structure of the intellect and breaks down into dimensions of "Content and Process," "Levels," and "Areas of Competency." The model assisted us in devising a format which would fit into our own unique problems. (Figure 1.)

The definitive model of Silber which was based on the writing of Finn, Heinich, Hoban, Silber, and others was also useful. In this instance, learning resource management functions are related to the learning resource development functions which, in turn, are related to the learning resources. (See A.V. Instruction, May 1970). Prigge listed the competency requirements for media management, media products development, and instructional program development. (A.V. Instruction, October 1972)

This information assisted us in getting the program under way. It was particularly useful in serving as a guide for the grouping of functions. However, we also needed to consider relationships between print

and nonprint media and their combined functions in a school setting. This imperative was dictated by the new composition of the Instructional Systems and Learning Resources Division. This division was a newly-formed unit in 1971 and was composed of Library Science and Media. Library Science had been a department without a college and functioned as an adjunct to the University of Utah Library. Almost all of the enrollment came from students in education, indicating a need for closer relationship with the Graduate School of Education. The merger of the Division of Instructional Media and the Department of Library Science became a reality with the formal approval of the State Board of Higher Education.

With all of this in mind, we elected to begin with the definition of the role that the instructional technologists would fill at the several levels. These roles evolved to include:

1. The university academician.
2. The resources administrator in the junior college and four-year liberal arts college.
3. The media specialist at the district level.
4. The media specialist at the school level.

We started with the individual building level, which would be the Master of Education in terms of degrees sought. Then, we moved to the district media specialist, which might well be the Education Specialist level; next, we moved to the community or technical college resources administrator, which might operate either at the Education Specialist level or at the doctoral level; and finally, we moved to the university media service administrator at the doctoral level, and the university academician, i.e., a professor, instructional developer, researcher and writer.

Having defined these levels, we tried to delineate the functions and the performance expectations. In order to define these functional expectations, we further divided them into competencies. The final breakdown was to determine what comprised competencies, defining these as clusters of behavioral objectives.

The broad curriculum or program areas into which we divided functions to more efficiently organize the competency statements differed somewhat from the Syracuse list mentioned earlier and included instructional design; evaluation and selection; integration, utilization and dissemination; media design and production; administration and implementation; data processing storage and retrieval; reference; instruction; research and development.

It became apparent to us after a time that we needed in some way to standardize our terminology. We found ourselves using such terms as "competency" in different contexts and with slightly different meanings. This was understandable since the literature was replete with such ambiguity of terms. We felt the need for the ongoing development and refinement of definitions, simplified and explicit for clarity and better communication. This was an extremely demanding undertaking and we found ourselves settling for definitions that we knew were less than perfect simply so that we could get on with the task at hand.

As part of our attempt to create some kind of a Gestalt from an ever-fragmenting effort, we flowcharted our activities and set benchmarks or interim objectives. The flowchart evolved from our major objective, which was to develop and implement a competency-based curriculum, through the following milestones:

1. Identify roles for professional positions.
2. Specify performance expectations for each role.
3. Specify competencies for each performance expectation.
4. Develop evaluative instruments and techniques.
5. Develop instructional program and materials.
6. Implement the CBC program.
7. Evaluate the CBC program.

Various areas were assigned to each member of the faculty to research individually. Once each week the total faculty continued to meet to consider the individual efforts and to critique, correlate and give direction to these efforts. This spread out the tasks so that we could work on the areas of preference and expertise. By early January 1972, our interim program had been plotted and the time line set out to define the roles of the media specialist at five different levels. This task was completed by March of 1972.

It was at this point that we became aware of the efforts of two men on our campus, Gaston Pol and Larrie Gale, to develop a model of competency using a new approach. They were working on companion doctoral studies involving the competence of administrators in the schools of Bolivia. The problem that had troubled us--that of defining competency--was also plaguing them. In spite of the work being done throughout the United States on competency-based programs, no one had bothered to set down specific definitions as to what the term "competency" really meant. In order to identify specific meanings and related meanings, Pol and Gale began to inspect language dictionaries and legal dictionaries in Portuguese, French, Spanish, Italian and English. They found a considerable agreement in the content of all of these sources. But the interesting

result of this research was that there was no definition of competency itself. Oh yes, there were attempts at defining; however, words that were employed in an effort to describe "competency" were, in turn, defined with the term "competency." In spite of all of this the team was able to develop from the available information a manageable rationale that was based, not on competencies, but on competences--they developed the idea of Areas of Competence.

Competence was defined as "the quality of being functionally adequate in performing the tasks and assuming the role of a specified position." In their case, it was the principalship with the requisite knowledge, ability, capability, skill and judgments. It is synonymous with idoniet . Competence is molar, consisting of several integrated parts.

Using the Pol-Gale materials, we broke the areas of competence down into components which were defined as requisite knowledge, ability, capability, skill and judgment, as per their schema. Proficiency in these components would yield competence. We then set about to attempt to define knowledge, ability, and so forth; that is, the component, in an effort to clarify what we were talking about at that level, what we were doing, and how we could express it. For example, we considered the relationships among meanings of ability, of competence, of competency, of competent, of capability, of capable, of information, of informative, of judgment, of knowing, of knowledge, of skill, of skilled, of proficiency, of proficient, of discernment, and so forth. There are numerous differences in definitions between sources. We simply duplicated definitions to compare them. Ultimately, we were able to arrive at a consensus as to what the terms mean and we were able to agree on how they should be used.

Additionally, we agreed that our format would consist of a specific competence which would, in turn, be made up of performance requirements that would be broken down into the components of performance, which, in turn, would be made up of knowledge, skill, ability, capability and judgment.

Precise performance requirements were formulated which were based on several sources of information. Input was obtained (1) from practitioners in the field through doctoral research; (2) from members of the staff; and later (3) from State personnel and the staffs of other institutions of higher learning in the state.

Although the components are spelled out in considerable detail, it would be unrealistic to require an individual to perform all of these. A more defensible approach is to identify certain predictors that verify competence across a more or less broad range of closely related performance components. The assumption would then be that if an individual is competent in X requirement, he is also competent in Y requirement and Z requirement and need not be tested in these areas. Strategies are being devised in order that such assumptions can be validated.

The format that we accepted as best fitting our needs had a design that included a statement of performance and then a breakdown into performance requirements. Otherwise, it was identical with the earlier format.

It was necessary to transform our analysis and statements of required competence to conform to the new, more meaningful definition of competence. As long as we were dealing primarily with skills, our previous efforts were acceptable, but when we started dealing with behaviors that were based on knowledge, ability, judgment or attitude,

we needed a broader concept. Using Reference as the Area of Competence, here is the way in which the broader definition of competence translates. (Figure 2.)

Now we returned to the problem of determining the goals of instruction, the teaching strategies, and the effectiveness of various assessment alternatives. Dr. Gabriel Della-Piana of the Bureau of Educational Research and the Center for the Improvement of Learning and Instruction provided us with a model that was modified to fit the problem at hand.

This model was referred to as the "Model of Mastery." It was composed of columns which were labeled "Description of Stimulus," "Act or Response," "Product," "Effectiveness," "Cost-Difficulty," and "Choice." The conditions for learning were listed, along with the student's response under the appropriate headings. Next, the product of the act was indicated and the effectiveness of the process was assessed. Effectiveness and cost-difficulty were considered as contributors to the selection of the best single alternative.

All too often what is tested is dictated by the form of the test. Thus, an instructor utilizes a multiple-choice paper-and-pencil test to determine what a person knows about a subject. This immediately and, unfortunately, eliminates from consideration any serious decisions relative to what should be tested, the significance of the performance to be tested, and the efficiency of the test model as compared with alternate models. One of the most serious deficiencies in instructional test procedure is the remoteness of what is measured as compared with the ultimate objectives of instruction.

The exercise of completing the models of mastery enabled us to select the single best alternative for a specific purpose from an array

of alternatives. The guide that we used presented a simple and manageable tool for the selection of a specific testing strategy. For example if the component of performance to be utilized were that of "knowing characteristics and uses of the basic kinds of graphic materials," then the alternative testing situations might be listed in the column labeled "Description of Stimulus" as follows:

Alternative one: Given a list of graphic materials, the student is directed to list characteristics and uses for each item.

Alternative two: Given a selection of actual graphic materials, the student is directed to identify each item and to list its uses.

Alternative three: Given a selection of actual graphic materials, the student is directed to use each in an appropriate manner.

The student's response to the stimulus would be listed under the "Act or Response" heading. These would include:

1. Lists uses for materials on paper or on audio tape.
2. Identifies and gives uses for each of the items.
3. Utilizes each item to produce a graphic product (might be a series of lines made with T-square and triangle, or letters made with LeRoy, etc.).

The result of the act or response, that is, the measurable outcome, would be listed in the column labeled "Product." These would include:

1. A list of uses, either written or audio tape.
2. Verbal or written identification and list of uses.
3. A selection of varying graphic solutions which will vary according to the materials employed.

The effectiveness of the various alternatives in measuring competence in the specified area is then assessed. The cost and the difficulty for both the instructor and the student is estimated, and finally, the

best single alternative is selected. Obviously, more than three, or less than three, alternatives might be listed.

Note that the proficiency, "knowing the characteristics and uses of the basic kinds of graphic materials," relates to the "knowledge" component of the model. You may recall that the CBC model of McCleary lists three levels of proficiency that can be employed. These are familiarity, understanding, and application. In this component, the student is required to reach the level of understanding. In a later unit, he will be required to apply his understanding in the actual creation of visual materials; then, he will be operating at the application level.

Alternatives that seem appropriate are being field-tested in the media courses on compus. This is time-consuming, but leads to a more legitimate decision than would be the case if selection were conducted intuitively.

It may be desirable in some instances to afford the student with a choice of alternatives. In this case, no single "best" would be designated. The selection of the "best" alternative is based in part on such institutional constraints as adequate facilities, available staff and proper equipment.

Incidentally, these stimulus situations would also be used as tests to determine whether a person brings a specific proficiency with him from previous experience. An individual who was able to display expertise in an area could be excused from repeating a module or modules that were designed to develop that expertise.

These tests, or models of mastery, were made out for each instructional situation, for each of the areas of competence, and at each of the

levels, i.e., individual building coordinator, district coordinator, and so forth.

With the model in the field-testing mode, the logical next steps involved considerations that have to do with the total competency-based curriculum.

As envisioned by the developmental faculty, the fully operational competency-based curriculum should not necessarily be based on a structure of courses and course work. We anticipate the possibility of modules which will provide several kinds of flexibility. First, modules will be created that will be highly individualized; second, the opportunity will be provided for students to cluster modules and, in a sense, make up their own courses; and third, the modules will provide opportunity for the experienced, mature student to demonstrate that he already possesses the competency provided by a specific module (if, indeed, he does possess it).

Recently, Dr. LeRoy Lindeman, State Administrator of Instructional Media, made us aware of his interest in our program. Instruments were needed that could be used to test for the required "competencies" at the basic and professional media endorsement levels. None were available.

On the basis of the work that has been accomplished, the University has received a grant from the State that will be used for the development of the necessary testing instruments. One of the difficulties anticipated has to do with the development of an equivalent assessment standard that will be acceptable to all of the institutions that are involved in the training of media personnel. To satisfy this imperative, at least in part, a consortium involving the other institutions of higher learning

and the State Board of Education has been formed. This group is charged with the development of competency-based assessment criteria for media programs throughout Utah.

First efforts at subsuming the behaviorally-based requirements listed in the state publication, Requirements for Instructional Media Endorsements, under the "Components of Performance" category of the model have pr ved to be singularly successful. Initial attempts to identify alternate teaching-assessment strategies using the "model of mastery" have proved to be highly satisfactory.

With this encouragement, we are moving ahead with the development and field testing of prototype modules in the areas of design and production as well as in the area of integration, utilization and dissemination.

McCLEARY'S MODEL FOR A COMPETENCY-BASED CURRICULUM

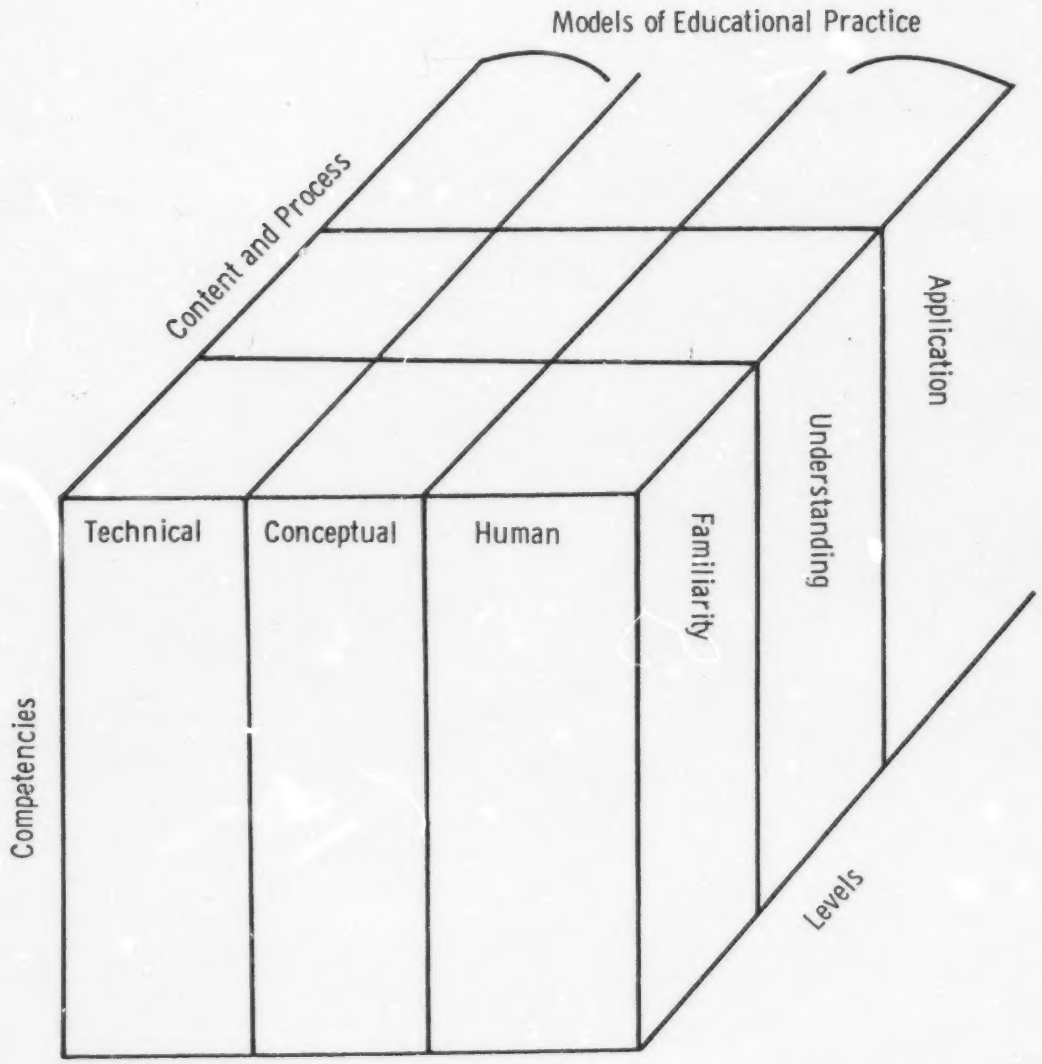

fig.1

PERFORMANCE

1.0 Provide Direct Reference Service to Students and Teachers.

PERFORMANCE REQUIREMENTS

1.1 DETERMINE THE TYPE OF REFERENCE SERVICE THAT WILL BE IMPLEMENTED IN A PARTICULAR MEDIA CENTER.

COMPONENTS OF PERFORMANCE

--know the various types of reference services.
--make judgments concerning the various types of reference services needed for particular media centers.

1.2 DETERMINE THE PATRON'S ACTUAL INFORMATION NEED, BY CONDUCTING THE REFERENCE INTERVIEW.

COMPONENTS OF PERFORMANCE

--know techniques used when questioning patrons.
--utilize techniques.

1.3 SELECT APPROPRIATE REFERENCE TOOLS THAT WILL SATISFY THE PATRON'S INFORMATION NEEDS. (Cheney, Reference Books--Enoch Pratt, Winchell and supplements.)

COMPONENTS OF PERFORMANCE

--know various reference materials available.
--make judgments concerning appropriate reference tools.
--able to correctly interpret citations from appropriate reference tools.

PERFORMANCE

2.0 Provide Indirect Reference Service to Students and Teachers.

PERFORMANCE REQUIREMENTS

2.1 COMPILE BIBLIOGRAPHIES, CATALOGS, INDEXES, AND OTHER AIDS THAT WILL INCREASE ACCESS TO THE EXISTING COLLECTION.

COMPONENTS OF PERFORMANCE

--know techniques used when compiling bibliographies, catalogs and indexes.
--make judgments concerning areas where aids to accessibility are necessary

2.2 APPLY ESTABLISHED CRITERIA FOR SELECTING REFERENCE MATERIALS. (Booklist, School Library Journal, Cheney, Katz, Shores, Winchell)

COMPONENTS OF PERFORMANCE

--know criteria used to determine the value of reference materials.
--know sources in which reference materials are reviewed.
--make judgments concerning reference materials to be purchased.

fig.2

AREA: DESIGN & PRODUCTION OF MEDIA ISLR MASTERY MODEL ALTERNATIVES PROFESSOR: R. V. Bullough

PERFORMANCE: Produces Teaching Materials (3.0)

PERFORMANCE REQUIREMENTS: SOLVES BASIC LAYOUT PROBLEMS THROUGH THE APPLICATION OF GRAPHICS SKILLS (3.2)

COMPONENTS OF PERFORMANCE: KNOWS THE CHARACTERISTICS OF THE BASIC KINDS OF GRAPHIC MATERIALS (3.2.1)

Description of Stimulus	Act or Response	Product	EFFECTIVENESS (High, Med., Low)	COST-DIFFICULTY		CHOICE
				Instructor	Student	
1. Given a list of graphic materials, the student is directed to list characteristics and uses for each item.	Lists uses for materials on paper or on audio tape.	List of uses, either written or audio tape.	Medium to high depending on approaches to other performance requirement solutions	Easy, cheap	Inexpen. easy	X (It is assumed that the ability to identify an item from its verbal description is equivalent to identifying the actual item)
2. Given a selection of actual graphic materials, the student is directed to identify each item and to list its uses.	Identifies and gives uses for each of the items.	Verbal or written identification and list of uses.	Medium to high	More time consuming and costly than #1, but still acceptable	Inexpen easy	
3. Given a selection of actual graphic materials, the student is directed to use each in an appropriate manner.	Utilizes each item to produce a graphic product. (Might be a series of lines mad with T-square and triangle, or letters made with LeRoy, etc.)	A selection of varying graphic solutions which will vary according to the materials employed.	High (However, may be covered adequately under comp. 3.2.2 and 3.2.3 as far as actual usage is concerned)		Most expen., time consuming & difficult of the 3	inexpen., difficult, time-consuming

Date: November, 1973

fig.3